Family Planning Program Effects in Rural Iran

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Abstract

Using data from the 2000 Iran Demographic and Health Survey, and a unique village-level data set, this study examines the effect of family planning program on fertility in rural Iran. My Findings confirm that the program succeeded in reducing the relative risk of higher order births. However, there is no clear evidence for the effect of the family planning program on delaying the first birth. The modest effect of the program suggests that non-program factors such as woman's education which show sizable impact should be credited for the fertility decline.

JEL classification: J13, I18

Key words: Family Planning, Fertility, Iran

1 Introduction

The remarkable decline in the fertility across high and low income countries in the late nineteenth century has generated different speculations about its main causes. Many researchers believe that change in socioeconomic factors is the major force behind the change in fertility behavior. Becker (1965) and Mincer (1963) hypothesized that economic development and the rise of wage rates in the twentieth century increased the opportunity cost of child rearing as the most time-consuming activity of parents. Woman's value of time is a key component in determining the price of children.

Becker (1960) and Schultz (1981) argued that had the cost of children stayed fixed, the increase in the lifetime wealth of parents in the twentieth century would

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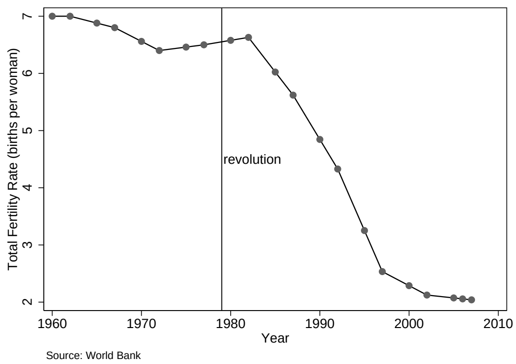
have raised the fertility. However, economic development raised the cost of having children. The decline in mortality reduced the demand for extra births, or as Schultz (1981) call them insurance births, to be replaced with the lost children. Also child survival rate increased as a consequence of the improvement in the child health technology which relaxed the pressure on birth rate to fulfill a particular number of surviving children. Moreover the cost of child's substitute services such as parent's health care and old-age pension has decreased since they are subsidized by government.
All these factors contributed the rise of children's cost which in turn reduced the demand for more children and encouraged parents to be more concerned about the quality of their children. Health and Human capital of children become a substitute for their numbers. The quality-quantity trade-off turned to be one of the modern challenges of families' fertility behavior (Becker 1960; Schultz 1981; Willis 1973).

Freedman (1997) argued that interest in creating family planning programs arose in many countries only after declines in mortality and other of development led to decrease in fertility preferences and created a potential demand for contraceptives in the population and a concern about fertility among government leaders. Various studies provide plausible evidence that the programs served to crystallize latent demand, that is to convert what are often somewhat uncertain and unambiguous desires not to have more children into a definite demand for birth control (Freedman 1997).

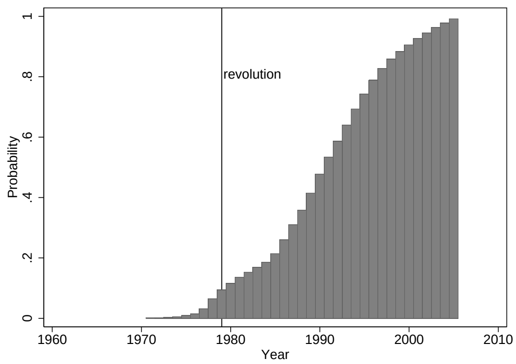
However, many observers do not think that the remarkable decline in fertility is due to the changing economic constraints facing families. Rather they associate this decline with the provision of subsidized modern birth control through organized family planning programs (Schultz 1997). Birth control has been argued as one of the factors that influence fertility. Countries which support effective family planning programs are thought to benefit from a lower TFR (Bongaarts, Mauldin, and Phillips 1990). It has been argued that fertility decline is produced by the family planning programs and educational campaigns which increase the knowledge about the fertility regulation and decrease the monetary and psychic cost of using birth control methods (Schultz 2007).

The important issue to consider is whether family planning programs have helped to decrease the number of births? or has the decline in fertility been the result of mortality decline, development, and ideational change? The role of family planning program on fertility has been questioned in the literature. Schultz (2001) argued that in high income countries the fertility decline occurred without the benefit of the birth control technologies or even introducing the family planning programs. Studies on the effect of family programs on fertility decline in low income countries such as Bangladesh (Joshi and Schultz 2007), Columbia (Miller 2005), and Peru (Angeles, Guilkey, and Mroz 2005) show only a moderate effect (10-15 percent of fertility decline) can be attributed to the family planning program. Pritchett (1994)'s major study, based mainly on cross-country multivariate analyses, advances the thesis that changes in desired family size that result from nonprogram forces account almost entirely for the adoption of contraception and for fertility decline in developing countries, whereas family planning programs account for a very small portion of these effects. In a multivariate analysis of 48 developing countries, Bongaarts (1997) finds that program efforts does not have a significant effect on wanted fertility, but the level of development significantly decreases it.

Iran's family planning program has been acclaimed for the largest and fastest fall in fertility ever recorded. In less than 20 years, the total fertility rate (TFR) declined from over 6 children per woman in the mid-1980s to 2.1 in 2000 (Abbasi-Shavazi and McDonald 2006; Abbasi-Shavazi et al. 2007; Hosseini-Chavoshi et al. 2006). Mehryar et al. (2001) called this program an "Iranian Miracle" and Boonstra (2001) suggested it as a model for developing countries. Figure 1(a) plots the TFR from 1960 to 2007. Part (b) shows the distribution of healthhouses (channels through which the program was implemented) over the same period of time. The timing of fertility decline appears to coincide with the development of family planning services which generates an interesting question about the possibility of effect of program on fertility.



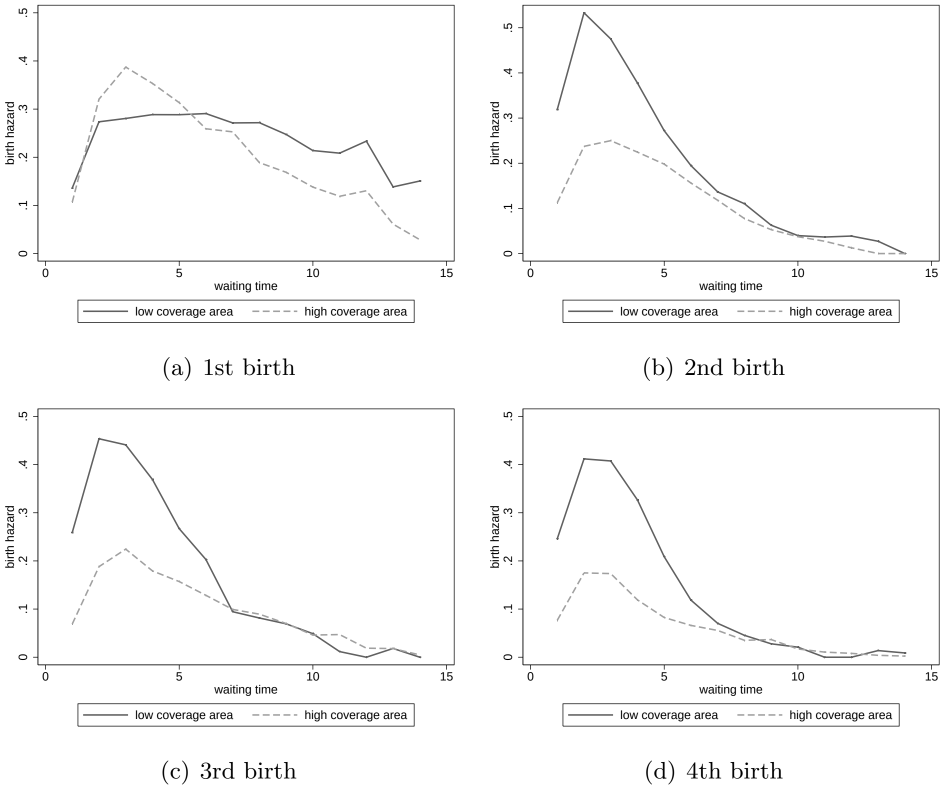
(a) TFR



(b) Health house establishment

Figure 1: Timing of fertility decline and health house establishment

Different speculations have been made about the reasons of the program's success. The expansion of contraceptive use, increase in woman's education and labor force participation and also the time effect have been argued as the reasons of the fertility decline (Roudi-Fahimi 2002; Erfani and Mcquillan 2008; Abbasi-Shavazi, Mehryar, Jones, and McDonald 2002). In their recent study, Salehi-Isfahani et al. (2009) tried to utilize a difference in difference framework and evaluate the impact of the program by comparing villages who were exposed to the program and villages who were not. They contributed 7% of the change in fertility to the program. However, none of these studies have examined the effect of family planning program on the timing and relative risk of first and higher order births. Since delaying the first birth and spacing higher order births are among the main program's objectives, studying the effect of program on relative risk of births seems to be necessary for the program evaluation. Birth hazard function is plotted in Figure 1 for high coverage (solid line) and low coverage areas (dashed line). This graphical evidence clearly shows the difference between first birth and higher order births. In this study, I focus on each birth separately and examine the influence of the program on the timing and relative risk of that particular birth.



(a) 1st birth

(b) 2nd birth

(c) 3rd birth

(d) 4th birth

Figure 2: Birth hazard function for high and low coverage areas

Iran's rural family planning program and health delivery services in general, is mainly relied on health houses. The health house construction program started in

the early 1970s and 30 years later almost all of the villages were covered by the healthhouse services[1]. In 1989, the new family planning program lunched and fertility control features were added to the healthhouses' regular services. The program included the provision of contraceptive services and devices and related training programs. In 1993, parliament passed a new family planning bill which removed all the economic incentives for large families. I will focus on these three milestones to identify the effect of healthhouse and family planning program on fertility and particularly, on the timing of different births. Four major time periods periods are defined based on the following important milestones:
(1) 1979: Islamic revolution
(2) 1989: new family planning program launched
(3) 1993: the family planning bill passed by legislature

The analysis is based on the birth history data gathered by the 2000 Demographic and Health Survey (DHS). It contains birth records and fertility information of 90,000 women ever married 15-49. The health house establishment information comes from another village level dataset which gathers information about the 15,000 healthhouses constructed over the period of 30 years. The selection of a village in which to build a healthhouse was not random and influenced by the local infrastructure. The important issue is to examine whether there are common variables which affect both fertility and placement. Ignoring these common factors will cause the biased estimates of program effect.

I first investigate the effect of healthhouse coverage on the risk and timing of first and higher order births using a discrete time hazard model. The critical time periods mentioned earlier will help me examine the change in the effect of healthhouse coverage after introducing family control services to the regular healthhouse activities. The difference can be attributed to the family program effect. My findings show that the program was not successful in delaying the first birth. There is no significant effect of healthhouse coverage on the relative risk of the first birth in none of the time periods. Instead, the program shows its significant effect on reducing the risk of higher order births. Also, woman's educational attainment played a salient role in changing the fertility behavior.
Next, I control for the potential endogeneity of facility placement by using a fixed effect estimation procedure. To examine the extent of the endogeneity problem, some features of districts are specified which could influence the economic, health, and environmental conditions of families. In particular, I control for the number of villages with middle school, mosque, piped water, and electricity in a district. These variables are indicators of district's rural area infrastructure which is expected to determine the district's healthhouse coverage. Result remains stable even after including these infrastructure variables which shows the extent of endogeneity problem that could be explained by these observable factors is very limited.

In the next section of this paper, Iran's family program is briefly reviewed. Es-

[1] In 2004, healthhouse services reached out to about 90% of the country's rural population (20.4 million individuals living in 4.2 million households).

timation issues related to nonrandom nature of the program placement is discussed in Section 3. Data is presented in Section 4, and estimation results are discussed in Section 5. The last section concludes.

2 History of Family planning program in Iran

In response to concerns about the rapid population growth in developing countries and its negative socioeconomic effect, many governments and nongovernmental organizations have implemented programs aimed at reducing birth rates. The first governmental family planning program was initiated in India in 1952. Since then the number and scope of these programs have expanded dramatically. By 1990, 95 % of the developing world's population lived in coutries providing some support for family planning programs. Iran's Family planning program started before the revolution. It was first introduced by ministry of health under the Shah in 1967 as part of the nationwide maternal and child services. During the next decade (1967-1976) fertility slightly declined. This decline largely happened in urban areas and was mainly contributed to massive economic growth rather than family planning program (Raftery, Lewis, and Aghajanian 1995).
After the revolution, like many other projects started by royal government, the program suspended because it was seen as a western concept. New Islamic government launched a new pro-natal policy in favor of larger families and early marriages. The need for combat forces during the eight years of Iran-Iraq war (1980-1988) fueled this policy. As a result, the 1986 census showed an enormous 3 percent annual population growth.
The war ended in 1988 and left the country with catastrophic damages. The need for a massive reconstruction and a rapidly growing population posed a challenging time for the government. After several publicity campaigns in 1988, ministry of health along with Plan and Budget Organization successfully convinced many of the top policy makers about the importance of family planning. The involvement of influential clergies helped the government to count on the support of the religious figures. The government officials emphasized on a *fatwa* by the late supreme leader, Imam Khomeini, that "contraceptive use was not inconsistent with Islamic tenets as long as it did not jeopardize the health of the couple and was used with the informed consent of the husband." (Mehryar et al. 2001)
The new family planning program officially launched in December 1989. The program followed three major goals: first, to postpone the first pregnancy; second, to increase the birth spacings and finally, to limit the family size to three (Roudi-Fahimi 2002). Iranian state-owned media started an informative campaign encouraging couples to have smaller families. Public clinics in urban areas and health houses in rural areas provided married couple with all modern contraceptive methods. A new law was passed in 1993 which removed all the economic incentives and social benefits for large families.

The program's success in declining the fertility was beyond any expectations. By 2000, the total fertility rate was reduced to 2.0 births per woman which is less than half what had planned for 2011. Roudi-Fahimi (2002) contributes the program's success to the effective educational programs by government and the health care delivery system. Since the focus of this paper is the fertility decline in rural areas, the rural health care system through which the family planning was implemented is discussed in more details in the next section.

2.1 Health care delivery system

Health care delivery system in Iran's rural area is mainly through health houses. Health house construction in rural areas started in early 1970s with very few health houses. It expanded gradually before the evolution but the major jump in health house construction happened in 1984 after that ministry of health was mandated by legislature to improve the rural health infrastructure. It reached its pick in 1989. By 2004, about 90% of the country rural population (20.4 million individuals living in 4.2 million households) had been covered by the program. Figure 1(b) shows the distribution of health house establishment. The construction program implemented in one district in each of the provinces and then expanded to other districts within each province, eventually. The selection was not random and according to officials in charge of the program, placement was mainly influenced by the local infrastructure and the availability of educated potential health workers.
The initial goal of the health care delivery system was to provide minimum health services like by the locally trained people. Two staff, a man and a woman, were recruited for each health house. The female worker was responsible for maternal and child health care and the male worker was in charge of environmental health such as water safety (Roudi-Fahimi 2002). The family planning services added to the health house regular services after the new family planning program launched in 1989. In the following sections, I will attempt to determine a causal link between the development of rural health care system, which is done by health house construction, and the change in relative risk of different births.

3 Empirical model and estimation strategy

The data is restructured to event history format which means each woman-year is considered as a separate observation. Since the effect of family planning program is on different births, each birth is modeled separately. For the first birth, each woman is followed from her first marriage until she gives birth to her first child. For second birth or higher, the woman is followed since her last giving birth until the current one. Those with no children stay in the sample from the year of first marriage to year 2000. The independent variable for woman-year observation is a dummy which shows whether the woman gave birth in that specific year. Since I am working with calendar year of each event, the discrete-time event history analysis method is being used. Logistic regression is the common method in estimating this type of models.

Estimation of the program effect is complicated by the fact that the health houses were distributed in a nonrandom fashion. Local infrastructure and availability of qualified health workers played an important role in the placement decision. It is quite possible that some of the factors involved in the placement decision have also influenced the fertility decision. For instance, cultural aversion to contraceptive can affect the administration's decision to implement the program in an area because they don't see the potential cooperation needed for success of the program. It also directly affects the fertility decision of women in that area. Ignoring such factors leads to biased estimation of program effect because part of the estimated program effect comes from these unobserved factors.

The problem of nonrandom placement can be defined as an omitted variable problem: the unobserved characteristics of an area which makes it attractive for the program placement is also omitted from the fertility equation. This issue has been discussed in the program evaluation literature as a source of estimation bias (Strauss and Thomas 1995). If these unobserved are constant over time (such as cultural and religious norms in the area, child preferences or natural fecundity) then this issue can be address by using fixed-effects estimator which is basically differencing out all the time invariant factors (observed and unobserved) from the regression (Rosenzweig and Wolpin 1986; Pitt et al. 1993; Gertler and Molyneaux 1994; Angeles et al. 1998). The fixed effect is relatively easy to implement and does not require a model of placement. However, it has its own disadvantages. It's restrictive on the specification of unobservables and also it could be inefficient.

The individual-level birth outcome is modeled using a retrospective data. This data structure enables me to follow each woman since first marriage to year 2000. The annual binary birth outcome at each age is modeled as a function of individual's characteristics of the woman such as her age and education, and community characteristics showing to what extent women in that region had access to various type of facilities. Woman's wage shows the value of her time and can be inferred as an indicator of her opportunity price. However wage is only available for a selected group of women and also is an endegeneous variable because is linked to woman's lifetime decisions and also related to her fertility (Schultz 2001). Schooling can be used a proxy for wage because for most people schooling is made before the start of childbreaing so it's pre-determined with respect to fertility. Schooling information is also available for the whole sample and selection is not a concern.

The fertility equation takes the following logistics form:

$$ln\left[\frac{P(B_{ijt}=1|X_{ijt},COV_{jt},\mu_j)}{P(B_{ijt}=0|X_{ijt},COV_{jt},\mu_j)}\right] = X_{ijt}\alpha + COV_{jt}\beta + \mu_j + \epsilon_{ijt}. \qquad (1)$$

where the dependent variable, B_{ijt}, takes the value of 1 if woman i in district j gives birth at year t, and 0 otherwise. The woman's fertility decision at time t is determined by: observed time varying personal characteristics (X_{ijt}), such as her age, education, and time since last giving birth; the coverage of health house services in the district (COV_{jt}); and the time-invariant local characteristic (μ_j) like the community's religious and cultural norms, are also influential. ϵ_{ijt} is a random disturbance that is uncorrelated with the μ_j. The time varying local characteristics are ignored in this study. However, time effect is captured by another variable. The hazard of a new birth varies with the time since the last birth. The nonrandom placement of health houses implies that μ_j is correlated with ϵ_{ijt}. The fixed-effects estimator is used to fix this problem by extracting μ_j from the regression. It can be implemented by inserting a dummy variable for each of the j districts.

4 Data

The individual level data for this study come from Iran Demographic and Health Survey of 2000 (DHS). DHS is a nationally representative survey of 113,913 households in 28 provinces (plus city of Tehran). In each province, 4000 households (2000 in rural and 2000 in urban areas) selected and 90,201 ever-married women 10-49 were interviewed. In this study, the sample is restricted to the rural areas (42,753 ever-married women age 15-49). DHS survey contains detail information on fertility, family planning practices, socioeconomic characteristics of women 10-49, and also the district of residence (Ministry of Health and Medical Education (MOHME 2002)). Unfortunately the district of residence is the smallest unit of location that can be found in DHS and the village of residence cannot be identified. Thus, all the community characteristics should be calculated in district level. A retrospective birth history is constructed based on the woman's first marriage and children's birth year. For each woman, I construct a woman-year series of observation including information for every year from the year of first marriage until 2000, the year of the survey. The dependent variable is a dummy variable which indicates whether the woman gave birth in a particular year. This retrospective information on timing of birth enables me to implement a discrete time hazard model of fertility.
Information on program placement includes data on year of health house establishment for 16,715 villages that had a Health House by 2005. Community characteristics such as variables indicating whether the village had middle school, mosque, electricity, and piped water, come from a village level dataset which contains this information for the following years: 1950, 1966, 1973, 1976, 1981, and 1986. The period of interest is 1951-2000 in which I examine the fertility outcomes of women who turned 15 years old in 1951 or later. To construct community characteristics for the whole period of 1951 to 2000, the values of closet year before the missing years are assumed. Since district is the smallest geographical devision that can be identified from the DHS, I turned the village characteristics to district level by defining the total number of villages in a district which uses that service (electricity, piped water) or facility (middle school, mosque) per 1000 rural residents of district. The district rural population comes from 1986 census. Health house coverage is calculated in district level and shows the number of health houses per 1000 rural women aged 15-49. The sample consist of 42,753 ever married women age 15-49 in 2000 who were living in 193 districts.
The dependent variable is an indicator variable which shows whether a woman gives births in a particular year. This variable contains 668,042 observations in the retrospective dataset in which a total of 159,991 birth events occurred. Using the

retrospective information on the timing of different births, I will implement a discrete hazard model in which each year-specific hazard rate depends on time variant explanatory variables.
The individual level variables include birth event decision, education, age, husband's education at year 2000, year dummies and the time since last birth (or time since first marriage for the first birth). Since different time periods are highly correlated with the expansion of healthhouses and also introducing the family planning program to the regular healthhouse services, it's necessary to control for time period effects. I do this by including 4 dummies for each of the following time periods: before the revolution of 1979; War period: after the revolution to the start of FP program in 1989 which reflects the effect of war and pro-natal policies of Islamic government; FP period: the shift in the government policy by launching the new FP program in 1989; and finally, FP bill period: the legislature reinforces the FP program by passing a new bill which removed all the economic incentives of having large families. Education is included in the model using a set of dummy variables for four education categories. These dummies are created by assuming that the women entered school at age 6 and remained there until the reported highest level of education was obtained. Duration of each interval in years is included to control for duration dependence. The first interval serves as the reference category. The last duration dummy represents the fifth or higher birth intervals.
The DHS contains some limited information on immigration. Each woman has been asked whether she has moved in the last five years and if so, how long has she been living in the new place and where was the previous place of residence. Based on this information, about 6.7 percent of women in the sample has moved in the last five years from which just 3 percent has moved from urban to rural. Since the fertility behavior of rural and urban areas are more likely to be different rather than two rural communities, moving between rural and urban seems to be more important than rural-rural migration. Also, since immigration is more likely to happen before the first birth, the higher order births are less likely to be affected by the problem of changing the sample's structure. Table 1 presents descriptive statistics for the variables included in the empirical model.
I first tried the simple logit model then I controlled for the non-randomness of program placement by using the fixed effect logit model. I also examined the effect of observable placement determinants on the simple logit estimates as a robustness check to examine the extent of endogeneity issue.

5 Estimation Results

Table 2 reports the estimated parameters of the logit regression. To asses the effect of controlling for endogeneity, I also estimate the fertility equation using a fixed effect logit procedure (Table 3). Each column shows a different birth. Unlike the district level fixed effect procedure, the simple logit model does not control for the endogeneity of program placement. The simple logit estimates will be consistent if there are no district level unobservables that affect both health house placement and fertility. District characteristics such as cultural norms are likely to play a significant role in the acceptance of the family planning program in an area. If the program administration decides to put their main focus on the areas where has the most cultural resistance then the coefficient of the program coverage will pick up the negative effect of these cultural norms as well as the main effect. This leads to underestimation of the the program effect. To control for the potential endogeneity I use 193 district-level dummy variables. These variables control for fixed district unobservables influencing the fertility. Because of the woman-year format of the data, each woman can be observed multiple times. I use Huber-White approximation of the covariate matrix to correct for the possible autocorrelation due to special data format. Since they are the only consistent estimates, I only discuss the fixed effect estimates.

The effect of health house coverage in each of the time periods is given by the sum of the main coverage effect and the interaction term measuring how the effect of coverage varies across years. For the first birth, the main effect is positive and the interactions are not significant except for the last time period which is negative and significant but still the sum with the main positive effect with the same size cancels out its effect. It seems that program did not have any significant effect on the probability of giving birth to the first child which indicates that the program failed to deliver one its main objectives in delaying the first birth. For higher order births, the effect of coverage becomes negative at the third and fourth time periods (FP period and Bill period) which shows a significant negative effect for the program after the introduction of new family planning program. The magnitude of this negative effect double folded in the last period which captures the effect of new FP bill passed by parliament in 1993.

The effect of age on fertility is decreasing for the first birth which shows the higher probability of having the first birth in early ages. For the third and more births, age effect follows an inverse U-shape curve which peaks at 25-29. This effect stays positive even after age 30 for the fourth and fifth births.

The role of the woman's education on her fertility has been extensively discussed in the literature and it's well established that more educated women tend to have less children (Martin and Juarez 1995; Cleland and Rodriacuteguez 1998; Willis 1973). In parallel with the literature, my results show that the fertility decreases as woman's education rises. This holds for all different births. The interesting point here is the difference between the effect of woman and her husband's education on fertility. Unlike the woman, husband's education encourages the first two births then it plays negative role (for secondary and upper) on fertility. The major difference between educated and uneducated husband comes to the picture slightly at third birth and strongly at fourth and fifth births.

The effect of age at first marriage is also different for the first birth and higher order births. It shows as the age of marriage increases so does the likelihood of giving birth to the first child. But it increasingly has negative effect on the probability of second and higher order births. The fertility of migrant rural households was negatively effected by the moving to urban areas and this is true for all different births.

The last set of variables which shows the duration before the birth clearly depicts the shape of baseline hazard function by year. The first year is excluded. The annual hazard of giving birth is higher for the second year and it peaks at the third year for all births. Similar to the age effect it's an inverse U shape curve.

An inspection of results across estimation methods reveals little differences in the results for most of the variables. The results for age and education is very stable across estimation methods. The fact that the sets of estimates are similar across methods suggests that the healthhouse placement can be treated as exogenous fertility determinant. I also examined this fact by introducing the placement determinants to the simple logit model and compare the results. Even after adding those district level variables to the original specification, the estimations are still very stable which again confirms the limited extent of endogeneity of placement in this case.

The magnitude of each variable's effect on fertility can be explained by marginal effects. Table 4 reports the average marginal effect of the logit model which is useful in comparing the effect of different factors on fertility. Comparing marginal effects of the program and those of woman's education indicates a much more important role for education on the fertility decline. In all different births the negative effect of education is nearly double of the program's.

6 Conclusion

Iran's dramatic fertility decline has generated many speculations about its roots of success. The shift from one of the fastest growing countries in the world to a country with the replacement fertility in less than 20 years has made Iran a unique case to study. The descriptive evidence presented in Figure 1 clearly shows the coincidence between the timing of fertility decline and the development family planning services. The government standpoint about the fertility has dramatically changed. The effect of this shift in policy can be observed by the change in the effect of healthhouse coverage in different periods of time. My results show that the new family planning program has significantly reduced the relative risk of higher order births. The program effect was dramatically strengthened after passing the new family planning bill in 1993. The effect of program on first birth is not significant and is marginal which shows that the program has not succeeded in delaying the first birth. But it clearly played a major role in delaying and stopping other births specially third birth and higher.

Comparing the marginal effect of different variables of the model on the fertility reveals that woman's education had much stronger negative effect than the program effect. This result is consistent with the other similar studies in the literature which contribute the fertility decline to the development and put less emphasis on the role of family planning programs.

Table 1: Descriptive Statistics

	Mean	Std. dev.
Woman's education		
Illiterate	0.607	0.488
Primary	0.307	0.461
Secondary	0.083	0.276
Tertiary	0.003	0.055
Husband's education		
Illiterate	0.421	0.494
Primary	0.401	0.490
Secondary	0.159	0.366
Tertiary	0.018	0.134
Time period dummies		
1966-1978	0.114	0.318
1979-1988	0.280	0.449
1989-1994	0.262	0.439
1995-2000	0.344	0.475
Birth dummies		
all births	0.239	0.427
1st birth	0.225	0.418
2nd birth	0.176	0.381
3rd birth	0.171	0.376
4th birth	0.153	0.360
5th birth	0.138	0.345
Woman's age (in 2000)	32.032	9.076
Age at first marriage	17.442	3.721
Moved in the last 5 years	0.070	0.255
Mortality of previous child	0.065	0.247
District characteristics		
(number of villages per 1000 rural residents)		
Primary school	1.591	5.683
Middle school	0.191	0.332
High school	0.090	0.306
Electricity	0.823	1.905
Piped water	0.868	3.042
Mosque	1.198	2.888
Coverage	1.833	1.681
Number woman-year observations		668,042
Number of women (in 2000)		42,753
Number of districts		193

Table 2: Estimates from standard logit regression (Odds ratios)

	1st birth	2nd birth	3rd birth	4th birth	5th birth
Coverage	1.022	1.171**	1.243**	1.113	1.327**
	(0.627)	(0.003)	(0.000)	(0.065)	(0.001)
(1979-1988)*coverage	1.056	0.942	0.855**	0.946	0.813*
	(0.220)	(0.260)	(0.002)	(0.338)	(0.011)
(1989-1994)*coverage	1.018	0.793**	0.740**	0.820**	0.703**
	(0.695)	(0.000)	(0.000)	(0.001)	(0.000)
(1995-2000)*coverage	0.944	0.601**	0.537**	0.597**	0.509**
	(0.193)	(0.000)	(0.000)	(0.000)	(0.000)
Age (15-19 excluded)					
20-24	0.842**	1.417**	1.609**	2.506**	5.560**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
25-29	0.381**	1.524**	1.829**	2.981**	7.727**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
30+	0.083**	0.772**	1.253**	2.394**	6.326**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Woman's education (illiterate excluded)					
primary	0.947**	0.758**	0.661**	0.625**	0.606**
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
secondary	0.942*	0.484**	0.389**	0.338**	0.333**
	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)
tertiary	0.698**	0.362**	0.260**	0.172**	0.150**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Husband's education (illiterate excluded)					
primary	1.131**	1.108**	1.046*	1.062**	1.003
	(0.000)	(0.000)	(0.018)	(0.003)	(0.884)
secondary	1.095**	1.007	0.838**	0.812**	0.729**
	(0.000)	(0.787)	(0.000)	(0.000)	(0.000)
tertiary	1.183**	1.217**	0.957	0.899	0.757*
	(0.000)	(0.000)	(0.497)	(0.212)	(0.015)
Age at first marriage	1.135**	0.964**	0.951**	0.938**	0.936**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moved in the last 5 years	0.880**	0.744**	0.761**	0.745**	0.745**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mortality of previous child		5.619**	1.657**	1.465**	1.477**
		(0.000)	(0.000)	(0.000)	(0.000)
Duration (dur=1 is excluded)					
2 periods	3.398**	2.539**	2.693**	2.564**	2.769**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
3 periods	4.505**	2.483**	3.031**	3.025**	3.451**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
4 periods	4.559**	1.997**	2.293**	2.323**	2.253**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
5 periods	4.086**	0.570**	0.748**	0.636**	0.564**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	135039	116075	113130	101283	91266

Robust p values in parentheses
* significant at 5%; ** significant at 1%

Table 3: Estimates from Fixed-Effects logit regression (Odds ratios)

	1st birth	2nd birth	3rd birth	4th birth	5th birth
Coverage	1.110*	1.066	1.056	0.969	1.145
	(0.029)	(0.283)	(0.344)	(0.629)	(0.155)
(1979-1988)*coverage	1.010	0.964	0.901	0.982	0.835*
	(0.829)	(0.512)	(0.055)	(0.766)	(0.035)
(1989-1994)*coverage	0.955	0.826**	0.800**	0.871*	0.740**
	(0.319)	(0.001)	(0.000)	(0.028)	(0.001)
(1995-2000)*coverage	0.886**	0.626**	0.580**	0.632**	0.534**
	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
Age (15-19 excluded)					
20-24	0.846**	1.430**	1.635**	2.553**	5.652**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
25-29	0.380**	1.561**	1.925**	3.152**	8.247**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
30+	0.083**	0.822**	1.376**	2.693**	7.288**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Woman's education (illiterate excluded)					
primary	0.959*	0.818**	0.728**	0.685**	0.666**
	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)
secondary	0.939*	0.533**	0.448**	0.389**	0.386**
	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)
tertiary	0.708**	0.387**	0.291**	0.201**	0.185**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Husband's education (illiterate excluded)					
primary	1.128**	1.149**	1.104**	1.122**	1.072**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
secondary	1.079**	1.044	0.895**	0.872**	0.789**
	(0.001)	(0.092)	(0.000)	(0.000)	(0.000)
tertiary	1.183**	1.238**	0.970	0.914	0.771*
	(0.000)	(0.000)	(0.634)	(0.292)	(0.027)
Age at first marriage	1.131**	0.963**	0.950**	0.936**	0.934**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moved in the last 5 years	0.871**	0.765**	0.813**	0.802**	0.812**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mortality of previous child		5.604**	1.611**	1.440**	1.456**
		(0.000)	(0.000)	(0.000)	(0.000)
Duration (dur=1 is excluded)					
2 periods	3.432**	2.587**	2.758**	2.622**	2.851**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
3 periods	4.615**	2.571**	3.178**	3.158**	3.663**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
4 periods	4.714**	2.092**	2.441**	2.476**	2.456**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
5 periods	4.248**	0.607**	0.814**	0.697**	0.643**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	135039	116075	113130	101283	91222

Robust p values in parentheses
* significant at 5%; ** significant at 1%

Table 4: Average Marginal Effects

	1st birth		2nd birth		3rd birth		4th birth		5th birth	
	ME	P-value	ME	P-value	ME	P-value	ME	P-value	ME	P-value
Coverage	0.002	0.619	0.026	0.002	0.033	0.000	0.015	0.058	0.033	0.000
(1979-1988)*cov	0.006	0.209	-0.010	0.249	-0.024	0.002	-0.008	0.327	-0.024	0.009
(1989-1994)*cov	0.002	0.688	-0.039	0.000	-0.046	0.000	-0.027	0.000	-0.041	0.000
(1995-2000)*cov	-0.006	0.183	-0.085	0.000	-0.095	0.000	-0.071	0.000	-0.078	0.000
Age (15-19 excluded)										
20-24	-0.018	0.000	0.061	0.000	0.080	0.000	0.150	0.000	0.270	0.000
25-29	-0.078	0.000	0.074	0.000	0.103	0.000	0.183	0.000	0.331	0.000
30+	-0.126	0.000	-0.041	0.000	0.036	0.000	0.142	0.000	0.294	0.000
Woman's education (illiterate excluded)										
primary	-0.006	0.001	-0.045	0.000	-0.062	0.000	-0.062	0.000	-0.055	0.000
secondary	-0.006	0.012	-0.108	0.000	-0.120	0.000	-0.117	0.000	-0.097	0.000
tertiary	-0.035	0.000	-0.139	0.000	-0.148	0.000	-0.150	0.000	-0.129	0.000
Husband's education (illiterate excluded)										
primary	0.013	0.000	0.017	0.000	0.007	0.016	0.008	0.003	0.000	0.881
secondary	0.010	0.000	0.001	0.782	-0.026	0.000	-0.028	0.000	-0.034	0.000
tertiary	0.019	0.000	0.034	0.000	-0.007	0.482	-0.014	0.190	-0.030	0.007
Age at first marriage	0.014	0.000	-0.006	0.000	-0.008	0.000	-0.009	0.000	-0.008	0.000
Moved in the last 5 years	-0.013	0.000	-0.047	0.000	-0.039	0.000	-0.038	0.000	-0.032	0.000
Mortality of previous child	-		0.336	0.000	0.084	0.000	0.056	0.000	0.049	0.000
Duration (dur=1 is excluded)										
2 periods	0.154	0.000	0.167	0.000	0.167	0.000	0.143	0.000	0.132	0.000
3 periods	0.209	0.000	0.164	0.000	0.193	0.000	0.177	0.000	0.172	0.000
4 periods	0.218	0.000	0.123	0.000	0.142	0.000	0.132	0.000	0.108	0.000
5 periods	0.186	0.000	-0.089	0.000	-0.043	0.000	-0.058	0.000	-0.060	0.000

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